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ABSTRACT

Statistical data presented on periodontal disease and oral hygiene among noninstitutionalized children, aged 6-11, in the United States are based on a probability sample of approximately 7,400 children involved in a national health survey during 1963-65. The report contains estimates of the Periodontal Index (PI) and the Simplified Oral Hygiene Index (OHI-S) by various demographic characteristics (age, sex, race, family income, education of head of household, geographic region). The PI, which reflects the presence or absence of gingival inflammation and obvious pocket formation, was used in assessing prevalence and severity of periodontal disease. The OHI-S, assessing oral hygiene, reflected presence or absence of oral debris (soft foreign material loosely attached to tooth) and oral calculus (hardened foreign material firmly attached). The report also contains a correlation analysis of the interrelation of the PI, OHI-S, and selected demographic characteristics. (KW)

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VITAL and HEALTH STATISTICS
DATA FROM THE NATIONAL HEALTH SURVEY
Series 11 - Number 117

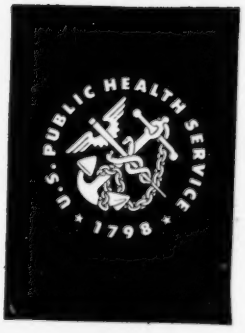
NATIONAL CENTER FOR HEALTH STATISTICS
NCHS

# Periodontal Disease and Oral Hygiene Among Children

## United States

U. S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
Public Health Service
Health Services and Mental Health Administration

Series 11 reports present findings from the National Health Examination Survey, which obtains data through direct examination, tests, and measurements of samples of the U.S. population. Reports 1 through 38 relate to the adult program. Additional reports concerning this program will be forthcoming and will be numbered consecutively. The present report is one of a number of reports of findings from the children and youth programs, Cycles II and III of the Health Examination Survey. These reports, emanating from the same survey mechanism, are being published in Series 11 but are numbered consecutively beginning with 101. It is hoped this will guide users to the data in which they are interested.

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Data from the
NATIONAL HEALTH SURVEY

Series 11
Number 117

# Periodontal Disease and Oral Hygiene Among Children

## United States

Estimates of the Periodontal Index (PI) and the Simplified Oral Hygiene Index (OHI-S) for noninstitutionalized children aged 6-11 years in the United States, by age, sex, race, family income, education of the head of household, and geographic region, and a correlation analysis of the interrelation of the PI, OHI-S, and selected demographic characteristics.

DHEW Publication No. (HSM) 72-1060

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service

Health Services and Mental Health Administration
National Center for Health Statistics
Rockville, Md. June 1972

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## COOPERATION OF THE BUREAU OF THE CENSUS

In accordance with specifications established by the National Health Survey, the Bureau of the Census, under a contractual agreement, participated in the design and selection of the sample, and carried out the first stage of the field interviewing and certain parts of the statistical processing.

**Vital and Health Statistics-Series 11-No. 117**

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# PERIODONTAL DISEASE AND ORAL HYGIENE AMONG CHILDREN

James E. Kelly, D.D.S., and Marcus J. Sanchez, *Division of Health Examination Statistics*

## INTRODUCTION

During 1963-65 the Division of Health Examination Statistics conducted a survey of the health of the Nation's children aged 6-11 years.[1] The survey was the second of a continuing series of sample surveys, or examination "cycles," undertaken to produce statistical information about the health of specific segments of the U.S. population through direct examination. In the initial cycle (1960-62) a probability sample of the Nation's adults aged 18-79 was examined.[2]

The universe from which the sample for the second examination cycle was drawn contained approximately 24 million children. It was defined as all noninstitutionalized children aged 6-11 years living in the United States (including Alaska and Hawaii) except those living on lands reserved for the use of American Indians. A probability sample of approximately 7,400 children (an average of about 185 at each of 40 locations) was designed and selected by a complex, scientific procedure described in appendix III. Examinations were conducted in mobile examination centers by physicians, dentists, psychologists, nurses, and technicians. Prior to the examination, information was obtained from the parent of the child, including demographic and socioeconomic data on the household members as well as medical history, behavioral, and related data on the child to be examined.

All sample children whose parents or guardians consented to their participation in the survey received the same examination which lasted approximately 3 hours. The examination focused on factors related to biological and psychological aspects of growth and development. Pediatricians examined the nose, throat, and ears; heart; and neuromuscular system of each child. The teeth and their supporting structures were examined by dentists, and school achievement, intellectual development, and personality development were measured by psychologists. Other procedures included tests of vision, hearing, exercise tolerance, grip strength, and breathing capacity. Blood pressure levels and electrocardiograms were recorded, as well as height, weight, and other body measurements.

Five dentists employed at various times during the survey conducted the dental examinations. They obtained their findings on a uniform basis by following as closely as possible written, objective standards. The standards were guidelines which, in effect, narrowed the range of examiner variability by eliminating several borderline or questionable conditions that are persistent sources of examiner disagreement. To avoid procedures that might have introduced systematic bias, teeth were not dried or isolated, oral debris and calculus were not removed, and tooth surfaces were not probed unless they were overtly decayed.

The prevalence and severity of periodontal disease were measured by the Periodontal Index (PI), a system of classification proposed by Russell in 1956.[3] By this method every tooth in the mouth, unless it is a root, is scored on a scale according to the presence or absence of manifest signs of periodontal disease. When a portion of the free gingiva is inflamed, a score of 1 is recorded.

When completely circumscribed by inflammation, teeth are scored 2. Teeth with frank periodontal pockets are scored 6 when their masticatory function is unimpaired and 8 when it is impaired. The arithmetic average of all scores is the individual's PI, which ranges from a low of 0.0 (no inflammation or periodontal pockets) to a high of 8.0 (all teeth with pockets and impaired function).

Oral hygiene was evaluated by the Simplified Oral Hygiene Index (OHI-S), a method described by Greene and Vermillion in 1964.[4] In the simplified method, the extent of oral debris and the extent of oral calculus are measured on selected surfaces of at least two of six predesignated teeth. The buccal surfaces of upper molars, the lingual surfaces of lower molars, and the labial surfaces of upper and lower central incisors are included. The proportion (in thirds) of the total surface area overlaid by debris and the proportion overlaid by calculus are averaged and then summed to give the OHI-S, which ranges from a low of 0.0 (no debris, stain, or calculus) to a high of 6.0 (more than two-thirds of the examined surfaces covered with both debris and calculus). Appendix I describes in greater detail the examining procedures for both oral hygiene and periodontal disease.

The PI and the OHI-S were also included in the examinations conducted during the 1960-62 survey of adults.[5] The same two dentists who trained new examiners during the adult survey also trained and periodically calibrated each of the other examiners during the survey of children. Thus, there is reason to believe that the findings collected on children are comparable with those previously collected on adults. In addition, a comparison of findings from replicate examinations suggests that interexaminer variability during the survey of children was adequately controlled, and that it did not seriously affect the periodontal and oral hygiene findings. The training and calibration of examiners are described in appendix I, which also includes a comparison of the periodontal scores obtained during the replicate examinations.

The dental examination also collected information about the occurrence of decayed, missing, and filled teeth. A report presenting national estimates of decayed, missing, and filled permanent and primary teeth among children aged 6-11 was published earlier.[6]

At the close of the survey in 1965, 7,119 children or 96 percent of 7,417 sample children had been examined. Information about the dental condition of the 298 unexamined children is not available to the survey staff. There are grounds, however, for assuming that nonresponse did not seriously bias the estimates based on survey findings. Nonrespondents made up only a small proportion of the entire sample. Moreover, information collected by household interview about both respondents and nonrespondents revealed no marked differentials in response rates associated with various demographic characteristics, including age, sex, race, geographic region, population density, parents' education, and family income.[1]

This report contains estimates of the PI and the OHI-S for U.S. children aged 6-11 by various demographic characteristics. It also contains a correlation analysis of the interrelation of the PI, OHI-S, and selected demographic characteristics.

## PERIODONTAL INDEX FINDINGS

As classified by the PI, an estimated 9.2 million children, or about 39 percent of the population aged 6-11 years, had either gingival inflammation or a more advanced form of periodontal disease. Virtually all children in whom positive signs of disease were found had gingivitis. By contrast, destructive disease with obvious pocket formation was rarely found, occurring in only about one out of every 125 children. Estimates of the number and percent of U.S. children 6-11 years of age by status of periodontal disease are as follows:

| Status of periodontal disease | Number of children in thousands | Percent |
|---|---|---|
| Total-------- | 23,750 | 100.0 |
| Without periodontal disease---- | 14,559 | 61.3 |
| With periodontal disease---------- | 9,191 | 38.7 |
| Without pockets-- | 9,004 | 37.9 |
| With pockets----- | 187 | 0.8 |

National estimates of the number of children with specified levels of the PI are shown in table 1. Periodontal disease, as measured by the PI, ranges from a mild inflammation of the marginal gingiva to a severe diffuse inflammation with advanced destruction of the supporting bone. As few as one tooth or as many as all the teeth normally present in the mouth may be involved. Although many children were classified as having an abnormal gingival or periodontal condition, the concentration of low scores clearly indicates that periodontal disease is neither a serious nor an immediate threat to the dental health of most children. For instance, about 95 percent of the estimated PI's of individual children were less than 0.6. The relatively few others ranged from 0.6 to a high of only 2.9.

The PI was designed for epidemiologic use, and it is both rapid and simple to apply. It is also a relatively objective classification which makes it especially suitable for epidemiologic surveys. But even though the PI does not classify periodontal disease by clinical criteria, specified ranges of the index among adults have been found to correspond generally with various clinical stages of gingivitis and chronic destructive disease. The relationship is described by Russell as follows: "Most persons considered to be normal, clinically, score from zero to .1 or .2; those with a clinical diagnosis of gingivitis, from .1 to 1.0; those with severe gingivitis to incipient destructive disease, from .5 to 1.9; those with frankly-established destructive disease, from 1.5 to 5.0; and those with disease in terminal stages from about 4.0 to 8.0, the maximum score."[7]

Ranges of the PI and their corresponding clinical stages have not been established for children. However, the condition prevailing among U.S. children can be described briefly as a mild, localized gingivitis which is transitory or would be transitory with more frequent and more thorough toothbrushing. This clinical impression is reflected in the present findings by the abundance of low scores and also by the narrow overall range of scores. Although relatively small differences in the PI usually are not significant clinically, they may nevertheless indicate variations in the prevalence and distribution of periodontal disease that may be significant epidemiologically.

## Age, Race, and Sex

The mean PI for all children was 0.13. Except for one age group, the mean score per person for children of all races increased slightly with age, rising from a low of 0.07 for the youngest children to a high of 0.16 for the oldest (figure 1 and table 2). Thus, age would seem to be a factor associated quite early in life with the occurrence of periodontal disease among U.S. children. The increase with advancing age was more consistent among white children than among Negro children.

The estimates in table 2 do not suggest that the PI is associated with either race or sex. The overall mean scores for white boys (0.13) and Negro boys (0.12) did not differ significantly from one another nor were the overall scores for white girls (0.13) and Negro girls (0.12) significantly different. Moreover, the average PI per child for white and Negro children whose age and sex were the same did not differ significantly. Estimates for the relatively few children belonging to specified races other than white or Negro are not presented separately in this report because of their excessively high sampling variability.

## Other Demographic Characteristics

In a previous report of dental findings among children, the frequency of decayed teeth and filled teeth was found to vary significantly with levels of family income and education of the head of household.[6] To determine whether similar trends also prevail in the occurrence of periodontal disease among children, the United States population 6-11 years of age was again classified by specified ranges of both family income and parents' education. It was also classified by geographic region.

After children were classified in this manner, any differences that appeared in the mean PI per child among various groups were examined. For example, mean periodontal scores for white boys whose family income was within one of five income ranges were examined to determine whether the mean count within a given income range differed significantly from those within other ranges. In addition, mean scores per child for all income ranges were compared to determine

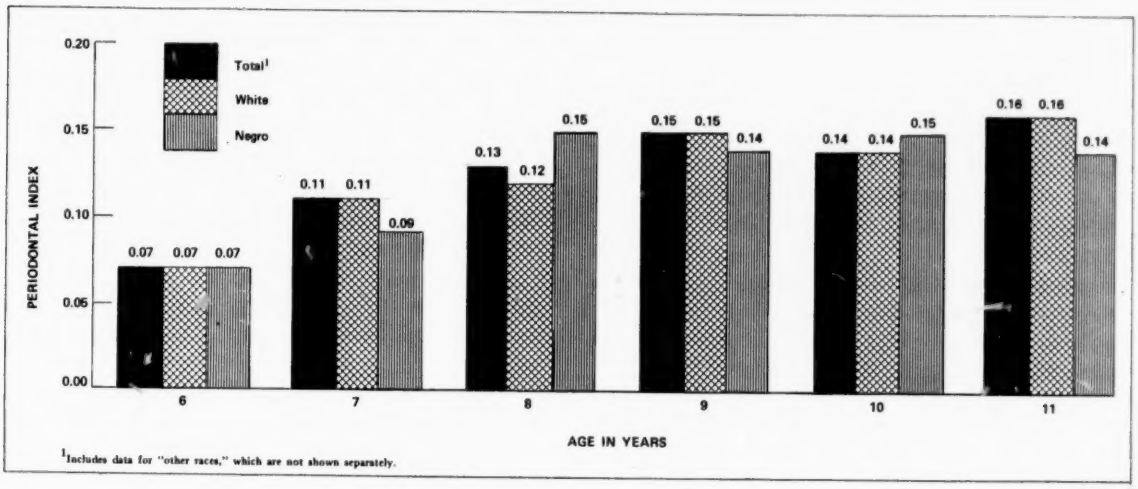


Figure 1. Average Periodontal Index for children, by race and age.

whether the PI trended higher or lower with increasing income. The comparisons were made among children of the same race and sex. Since periodontal scores differed by age, adjustment was made for differences in the age distribution of the children within each income and education group and within each geographic region by calculating age-adjusted values.

Expected (age-adjusted) values were calculated by weighting the age-sex-race-specific mean PI per child for the total United States population of children by the number of children in that age-sex-race group within specified ranges of income or education. Actual and expected values may differ by chance. But, when the difference is significant, one may conclude that the mean PI of a given sex-race-income group or a sex-race-education group is excessively larger or smaller than the mean of that sex-race group for the United States and that this excess is independent of age.

Because of the relatively limited number of sample children, sampling variability for specific age groups is usually quite large. It is for this reason that summary comparisons of actual and expected values were preferred to a comparison of mean age-specific values.

*Income and education.*—The occurrence of gingival inflammation among children was inversely associated with the amount of yearly income earned by their families. Among children of all races the average score per child fell consistently with rising income from a high of 0.18 for children in families with the smallest incomes to a low of 0.05 for those in families with the highest incomes (table 3). In addition, it can be seen that children whose families earned less than $5,000 yearly had significantly higher scores than expected, and those whose families earned more than $7,000 yearly had significantly lower scores than expected. Differences between actual and expected mean periodontal scores per child are also shown in figure 2.

The inverse relationship of periodontal scores and family income prevailed among both white and Negro children, but the relationship was more pronounced among the whites (table 3). The trend was about equally consistent among white boys and girls; for Negro children, on the other hand, the trend was more consistent among girls than it was among boys.

In the U.S., income is highly and positively correlated with the number of years of formal education completed. The PI's of children would therefore be expected to vary with the educational achievement of parents as they did with family income. The estimates in table 4 show that the

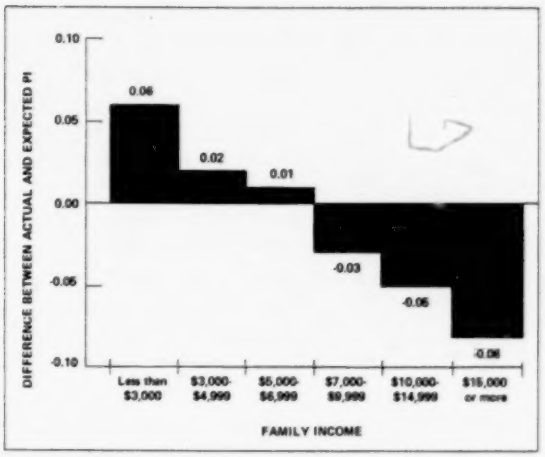


Figure 2. Differences between actual and expected average Periodontal Index for children aged 6-11 years, by family income.

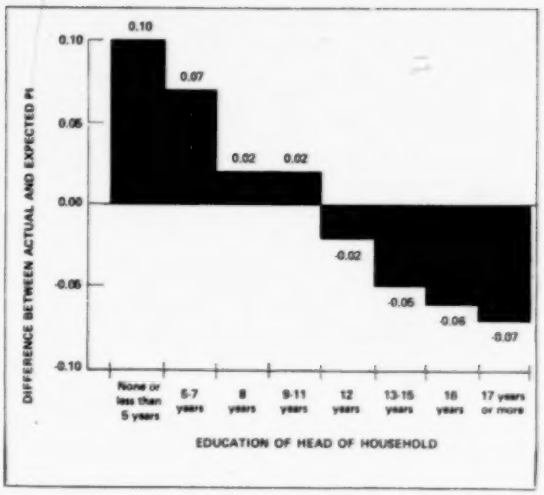


Figure 3. Differences between actual and expected average Periodontal Index for children aged 6-11 years, by education of head of household.

PI is indeed associated with parents' educational levels and that the association parallels in most respects that of mean scores with family income. For example, children of all races whose parents had completed 12 years of schooling or more had significantly lower scores than expected, and those whose parents had completed 11 years of schooling or less generally had higher scores than expected (figure 3). The association of periodontal scores with parents' education was more consistent among white children than among Negro children and about equally consistent among white boys and girls.

*Geographic region.*—Mean periodontal scores per child were lower in the West (0.07) and Midwest (0.09) than in the Northeast (0.17) and South (0.18), as shown in table 5. However, the only significant differences between mean scores per child were for children living in the South, who had higher scores than those living in the Midwest and West.

Table 5 also contains estimates of the average PI for white and Negro children by sex and region of residence. The mean PI's for white children did not vary significantly by region. Among Negro children boys and girls living in the South had higher mean scores per person than did those living in the West.

## SIMPLIFIED ORAL HYGIENE INDEX FINDINGS

The estimated average OHI-S for the approximately 24 million children was 1.44 (table 6). The component indexes measuring debris (DI-S) and calculus (CI-S) were 1.42 and 0.02, respectively. The estimates indicate, in short, that faulty oral hygiene among children is due almost entirely to the presence of debris (soft foreign material loosely attached to teeth). Calculus (hardened foreign material firmly attached to teeth) was found only in relatively few children. The number and percent of children with specific oral hygiene scores are shown in table 7.

### Age, Race, and Sex

Differences in oral hygiene occurred with age (table 6 and figure 4). Beginning at age 7, the OHI-S decreased slightly but steadily with age, falling from 1.50 to a low of 1.40 for 11-year-old children. The improvement in oral hygiene corresponded to decreasing amounts of debris, suggesting that as age increases children brush their teeth more thoroughly and perhaps more frequently. Calculus, on the other hand, accumu-

lates slowly with advancing age, resulting in a rise in the CI-S from 0.00 for children aged 6 to 0.05 for children aged 11.

White children had somewhat better levels of oral hygiene than did Negro children. As a result, the average OHI-S was 1.41 for the former and 1.66 for the latter. At every given age the DI-S and CI-S for Negro children were higher than those for white children.

The estimates in table 6 indicate that there is not a significant association between sex and the oral hygiene status of children. Although in every age and racial group boys had slightly higher mean OHI-S scores per person than did girls, only the mean scores of 11-year-old boys and girls of all races differed significantly from one another.

## Other Demographic Characteristics

Since the oral hygiene status of children varied with age, actual and expected (age-adjusted) estimates of the average OHI-S are presented in the following sections to determine whether oral hygiene status is also associated with family income, education of the head of household, and geographic region. Expected estimates of the OHI-S were calculated in the same way that expected estimates of the PI were calculated.

*Income and education.*—The oral hygiene status of U.S. children was associated with the amount of yearly income earned by their families (table 8). As family income increased, the estimates show, the average OHI-S per child became less. The decrease in the OHI-S was consistent, with progressively smaller mean scores occurring with each added increment of income. Thus, the index fell from a high of 1.69 for children in families earning less than $3,000 to 1.31 for those with family incomes of $7,000-$9,999 and, finally, to a low of 1.21 for those in the highest income group. The differences between actual and expected estimates were significantly higher than expected for children whose families earned less than $3,000 yearly and significantly lower than expected for those whose families earned $7,000 yearly or more (figure 5).

The inverse association of the OHI-S with family income prevailed among both white boys and white girls and less consistently among

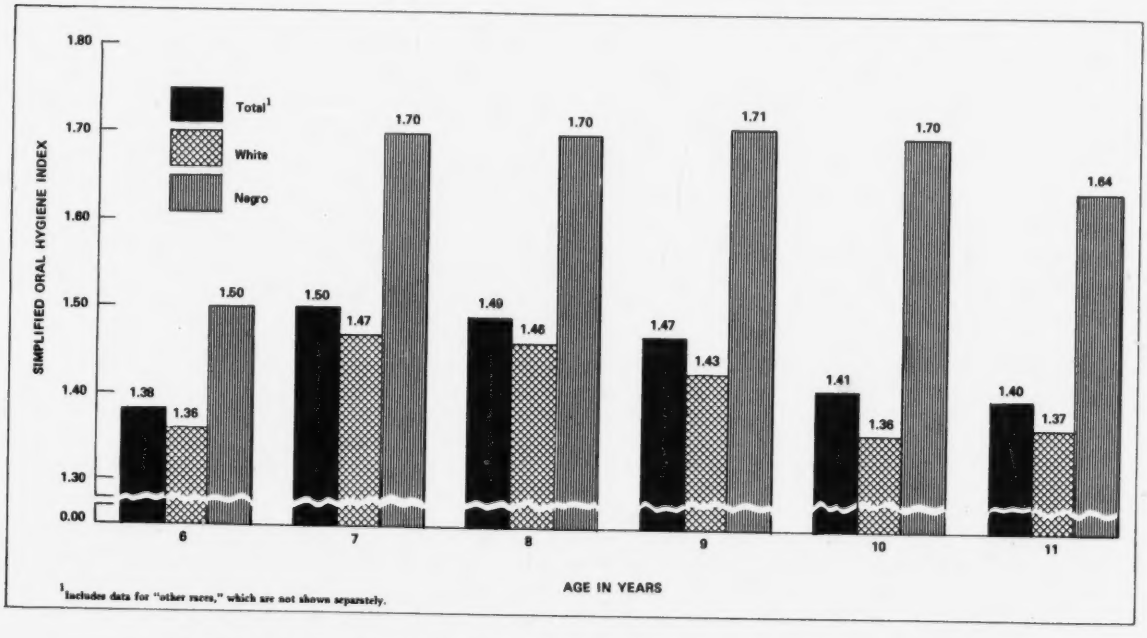


Figure 4. Average Simplified Oral Hygiene Index for children, by race and age.

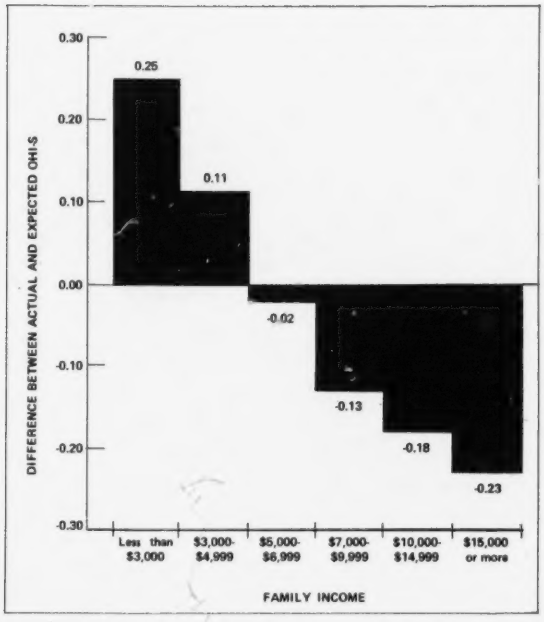


Figure 5. Differences between actual and expected average Simplified Oral Hygiene Index for children aged 6-11 years, by family income.

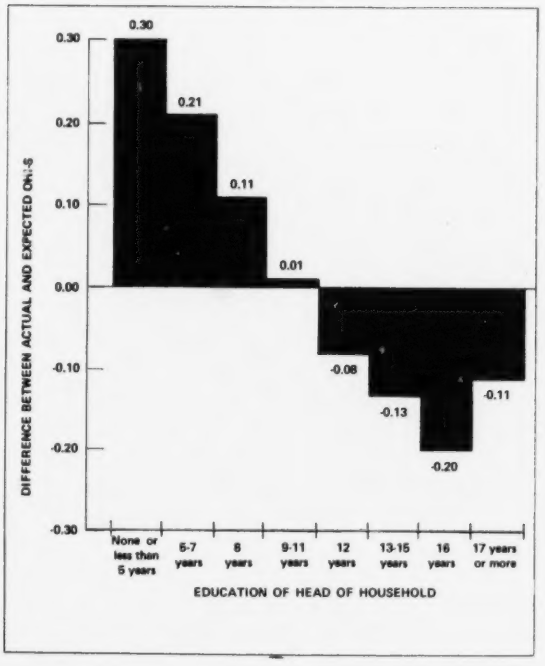


Figure 6. Differences between actual and expected average Simplified Oral Hygiene Index for children aged 6-11 years, by education of head of household.

Negro boys and girls (table 8). Interestingly, the average score per child, except for girls in families earning $10,000-$14,999 yearly, was less for white children than for Negro children of the same sex and in the same income group.

As again expected, because of the relationship of income with educational attainment, the oral hygiene status of children was also associated with the number of years of formal schooling completed by their parents (table 9). The association paralleled that just described of oral hygiene with family income. Prevailing among both boys and girls, the association of level of education with oral hygiene status was an inverse one that was stronger among white children than among Negro children. In addition, it was independent of age, with many of the differences between actual and expected values being statistically significant (figure 6).

Differences in oral hygiene status associated with race and sex also persist in the estimates in table 9. In almost all of the education groups girls had lower average oral hygiene scores per person than did boys, as did white children compared with Negro children of the same sex.

*Geographic region.*—Table 10 contains estimates of the average OHI-S by region of residence. The estimates for children of all races and for white children did not differ significantly for any region. Among Negro children girls residing in the South had significantly higher mean oral hygiene scores per child than did girls in the Northeast and Midwest.

## DISCUSSION

The estimates presented in this report indicate that both the occurrence of gingival disease and the status of oral hygiene among U.S. children are associated with various demographic characteristics. The association of periodontal disease with several characteristics does not parallel the association of oral hygiene with those

same characteristics. For example, periodontal scores for older children tended to be higher than those for younger children, but oral hygiene scores trended lower with advancing age. Further, the mean PI per child did not vary significantly with race, whereas the mean OHI-S was consistently lower for white children than for Negro children. Finally, significant differences in mean periodontal scores found among four geographic regions did not coincide with regional differences in oral hygiene status. On the other hand, the prevalence and severity of gingivitis and the occurrence of poorer oral hygiene were inversely and strongly associated with both family income and educational attainment of the head of household.

The association of periodontal disease and oral hygiene among U.S. adults aged 18-79 has been investigated previously.[8] Both conditions were closely associated with numerous demographic variables. More periodontal disease and poorer oral hygiene were found in older than in younger adults, in men than in women, and in Negro adults than in white. Men and women who were economically and educationally less advantaged also had more periodontal disease and poorer oral hygiene than others. However, differences in the distribution of periodontal disease associated with the various demographic variables (except age) were either largely or fully accounted for when allowance was made for variations in oral hygiene. In short, both age and oral hygiene emerged as significant factors associated with the prevalence and severity of periodontal disease.

Comparison of the findings on children with those on adults suggests that the occurrence of periodontal disease and the presence of oral debris and calculus are not as closely associated among children as they are among adults. There are several reasons why this might be so. First, poor oral hygiene among children is due largely to the presence of oral debris. Although the overall estimated OHI-S for U.S. adults was only slightly higher than that for children—1.5 as compared with 1.44—the index for adults reflected the presence of appreciable amounts of calculus (a CI-S of 0.6).

There is also an important difference in the occurrence of periodontal disease among adults and among young children. Because only relatively few children have periodontal pockets, the PI for children primarily measured the presence of gingival inflammation. In contrast, destructive periodontal disease was frequently found among adults, occurring in approximately one out of every four.

It should also be noted that the association of periodontal disease with poor oral hygiene may be less consistent among children than among adults because of the narrow age range of the sample children. Thus, manifestations of periodontal disease associated with poor oral hygiene might be expected to be less clear and definite in childhood (ages 6-11) than they are in adulthood, when they have had a much longer period to develop.

Finally, gingival inflammation among children is often associated with tooth eruption. More permanent teeth erupt during ages 6-11 than at any other time. For instance, 6-year-old children averaged about five erupted permanent teeth per child, whereas 11-year-old children had about 22 per child.[6] Thus, the PI for children, unlike that for adults, reflects the presence of inflammation associated with tooth eruption.

In summary, significant qualitative changes occur in both periodontal disease and oral hygiene status with advancing age. The PI and the OHI-S measure only quantitative differences, which for children 6-11 years are so slight that they usually have little or no clinical significance. As a result, it is perhaps more surprising that the PI and OHI-S were associated with several demographic characteristics of children than that they both were not consistently associated with all of the characteristics that were studied.

The interrelation of the PI, the OHI-S, and selected demographic variables can be further assessed by the statistical method of correlation analysis. By this method, the relative strength of the association of selected variables with the PI can be quantified separately by calculating simple correlation coefficients. Additional insight into the relationship of the variables with each other and with the PI can be obtained by calculating partial coefficients which quantify the correlation between each variable and the PI when the associations between the other variables and the PI are accounted for and held constant. The partial coefficients can then be compared with the corresponding simple coefficients to

Table A. Correlation coefficients between the Periodontal Index and selected variables: United States, 1963-65

| Selected variable | Correlation coefficients and standard errors | | | |
|---|---|---|---|---|
| | Simple | Standard error | Partial for five-variable equation | Standard error |
| OHI-S | .24 | .035 | .21 | .035 |
| Age | .12 | .014 | .12 | .013 |
| Education of head of household | -.20 | .024 | -.12 | .016 |
| Family income | -.14 | .030 | -.01 | .022 |

determine the degree of independent correlation each variable has with the PI.

The simple correlation coefficients shown in table A indicate that the OHI-S is more strongly associated with the PI than are age, income, and education of the head of household. However, the correlation of the OHI-S with periodontal scores ($r$=.24) is only slightly more than that of education with periodontal scores ($r$=-.20).

The partial correlation coefficients in the table indicate that of the four selected variables the OHI-S is the best predictor of the occurrence of periodontal disease if the influence of the other three variables is accounted for and held constant. The degree of association of education with the PI is nearly halved and, reflecting the high correlation between family income and education of the head of household ($r$=.58), that of income virtually disappears. The influence of age on the PI is unchanged by accounting for the associations of the other variables. Thus, among children as among adults age and oral hygiene emerge as significant factors associated with the occurrence of periodontal disease.

## SUMMARY

Estimates of the prevalence and severity of periodontal disease among U.S. children 6-11 years old indicated that only about one out of every 125 children had chronic destructive disease characterized by obvious pocket formation. About 40 percent of the children had some degree of gingivitis, but the inflammatory condition occurring in most was mild and limited to only a few teeth.

Faulty oral hygiene, due primarily to the presence of soft foreign material loosely attached to teeth, was highly prevalent among U.S. children. Although about one-third of the children had relatively little or no deposits on their teeth (OHI-S of 1.0 or less), the remaining two-thirds had moderate to heavy amounts of debris.

National estimates of periodontal disease and oral hygiene were based on the examination during 1963-65 of 7,119 children or 96 percent of a probability sample of 7,417 children representative of the nearly 24 million noninstitutionalized U.S. children aged 6-11 years. The prevalence and severity of periodontal disease were assessed by the Periodontal Index (PI), which reflects the presence or absence of gingival inflammation and obvious pocket formation. Oral hygiene status was assessed by the Simplified Oral Hygiene Index (OHI-S), which reflects the presence or absence of oral debris (soft foreign material loosely attached to the tooth) and oral calculus (hardened foreign material firmly attached to the tooth). The PI ranges from a low of 0.0 (no inflammation or periodontal pockets) to a high of 8.0 (all teeth with pockets and impaired function). The OHI-S ranges from a low of 0.0 (no debris, calculus, or stain) to a high of 6.0 (more than two-thirds of the examined surfaces covered with both debris and calculus).

The average PI for the approximately 24 million U.S. children who were 6-11 years old was 0.13. Except for children aged 10, the mean score

per person increased with advancing age, rising from a low of 0.07 for the youngest children to a high of 0.16 for the oldest. The trend with age was more consistent among white children than among Negro children. The PI did not vary significantly by either race or sex.

The average OHI-S for all children was 1.44. The component indexes of the OHI-S—the Simplified Debris and Calculus Indexes—were 1.42 and 0.02, respectively. Beginning at age 7, the OHI-S decreased slightly but steadily with age, falling from 1.50 to a low of 1.40 for 11-year-old children. The slight but steady improvement in oral hygiene with age resulted from smaller amounts of debris on the teeth of older children. Deposits of calculus, on the other hand, increased slightly with age.

Oral hygiene status also varied by race. At every given age, white children had less debris and less calculus than did Negro children. A difference in oral hygiene associated with sex was found only among 11-year-old children of all races, with boys having a significantly higher mean OHI-S than did girls.

Both the average PI per child and the average OHI-S per child were inversely associated with increasing family income and increasing number of years of formal education completed by the head of household. Among children of all races, for example, the mean PI per child fell consistently with rising income from a high of 0.18 for children in families earning less than $3,000 yearly to a low of 0.05 for those in families earning $15,000 yearly or more. The mean OHI-S per child for all children also fell steadily with rising income, dropping from 1.69 for those in families with the lowest incomes to 1.21 for those in families with the highest incomes. The associations of periodontal and oral hygiene scores with family income and education of the head of family prevailed among both boys and girls. The associations were more consistent among white children than among Negro children.

Mean periodontal scores per child for children of all races were lower in the West (0.07) and Midwest (0.09) than in the Northeast (0.17) and South (0.18). However, the only significant differences between mean scores per person were for children living in the South, who had higher scores than did those living in the Midwest and West. In addition, Negro boys and girls living in the South had higher mean scores per person than did Negro children living in the West.

Mean oral hygiene scores for children of all races and for white children did not vary significantly by geographic region. Among Negro children, however, girls living in the South had higher mean scores per child than did those living in the Northeast and Midwest.

The associations of the PI and the OHI-S with various demographic characteristics of children are apparently not as strong as they were previously found to be among U.S. adults 18-79 years of age. This difference may be at least partly attributable to qualitative changes in both periodontal disease and oral hygiene status that occur with age. However, a correlation analysis of the interrelation of the PI, the OHI-S, age, family income, and education of the head of household indicates that both age and oral hygiene are significant factors associated with the occurrence of periodontal disease among children, as they also were among adults.

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Table 1. Number and percent of children aged 6-11 years, by Periodontal Index and sex: United States, 1963-65

| Periodontal Index | Boys | Girls | Boys | Girls |
|---|---|---|---|---|
| | Number in thousands[1] | | Percent | |
| Total- | 12,061 | 11,689 | 100.0 | 100.0 |
| 0.0------- | 7,225 | 7,334 | 59.9 | 62.7 |
| 0.1------- | 1,448 | 1,318 | 12.0 | 11.3 |
| 0.2------- | 1,136 | 930 | 9.4 | 8.0 |
| 0.3------- | 841 | 677 | 7.0 | 5.8 |
| 0.4------- | 439 | 377 | 3.6 | 3.2 |
| 0.5------- | 343 | 319 | 2.8 | 2.7 |
| 0.6------- | 161 | 204 | 1.3 | 1.7 |
| 0.7------- | 116 | 145 | 1.0 | 1.2 |
| 0.8------- | 93 | 91 | 0.8 | 0.8 |
| 0.9------- | 84 | 58 | 0.7 | 0.5 |
| 1.0------- | 52 | 96 | 0.4 | 0.8 |
| 1.1------- | 35 | 39 | 0.3 | 0.3 |
| 1.2------- | 46 | 25 | 0.4 | 0.2 |
| 1.3------- | 16 | 25 | 0.1 | 0.2 |
| 1.4------- | 6 | 14 | 0.0 | 0.1 |
| 1.5------- | 3 | 15 | 0.0 | 0.1 |
| 1.6------- | 3 | 3 | 0.0 | 0.0 |
| 1.7------- | 4 | - | 0.0 | - |
| 1.8------- | - | 7 | - | 0.1 |
| 1.9------- | - | 3 | - | 0.0 |
| 2.0------- | 4 | 7 | 0.0 | 0.1 |
| 2.1------- | - | - | - | - |
| 2.2 or more----- | 4 | 4 | 0.0 | 0.0 |

[1] Rounded to nearest thousand.

Table 2. Average Periodontal Index for children, by race, sex, and age: United States, 1963-65

| Sex and age | Total[1] | White | Negro |
|---|---|---|---|
| Both sexes | | | |
| 6-11 years- | 0.13 | 0.13 | 0.12 |
| 6 years---------- | 0.07 | 0.07 | 0.07 |
| 7 years---------- | 0.11 | 0.11 | 0.09 |
| 8 years---------- | 0.13 | 0.12 | 0.15 |
| 9 years---------- | 0.15 | 0.15 | 0.14 |
| 10 years--------- | 0.14 | 0.14 | 0.15 |
| 11 years--------- | 0.16 | 0.16 | 0.14 |
| Boys | | | |
| 6-11 years- | 0.13 | 0.13 | 0.12 |
| 6 years---------- | 0.07 | 0.08 | 0.06 |
| 7 years---------- | 0.10 | 0.11 | 0.08 |
| 8 years---------- | 0.13 | 0.13 | 0.15 |
| 9 years---------- | 0.15 | 0.15 | 0.14 |
| 10 years--------- | 0.14 | 0.14 | 0.14 |
| 11 years--------- | 0.16 | 0.16 | 0.15 |
| Girls | | | |
| 6-11 years- | 0.13 | 0.13 | 0.12 |
| 6 years---------- | 0.07 | 0.07 | 0.07 |
| 7 years---------- | 0.11 | 0.11 | 0.11 |
| 8 years---------- | 0.13 | 0.12 | 0.15 |
| 9 years---------- | 0.15 | 0.16 | 0.14 |
| 10 years--------- | 0.14 | 0.13 | 0.16 |
| 11 years--------- | 0.16 | 0.16 | 0.12 |

[1] Includes data for "other races," which are not shown separately.

Table 3. Actual and expected average Periodontal Index for children aged 6-11 years, by sex, race, and family income: United States, 1963-65

| Race and family income | Both sexes | | | Boys | | | Girls | | |
|---|---|---|---|---|---|---|---|---|---|
| | Actual | Expected | Difference | Actual | Expected | Difference | Actual | Expected | Difference |
| Total[1] | | | | | | | | | |
| Less than $3,000 | 0.18 | 0.12 | 0.06 | 0.17 | 0.12 | 0.05 | 0.19 | 0.13 | 0.06 |
| $3,000-$4,999 | 0.14 | 0.12 | 0.02 | 0.13 | 0.12 | 0.01 | 0.16 | 0.13 | 0.03 |
| $5,000-$6,999 | 0.13 | 0.12 | 0.01 | 0.14 | 0.12 | 0.02 | 0.12 | 0.13 | -0.01 |
| $7,000-$9,999 | 0.10 | 0.13 | -0.03 | 0.10 | 0.13 | -0.03 | 0.09 | 0.12 | -0.03 |
| $10,000-$14,999 | 0.08 | 0.13 | -0.05 | 0.08 | 0.13 | -0.05 | 0.08 | 0.13 | -0.05 |
| $15,000 or more | 0.05 | 0.13 | -0.08 | 0.05 | 0.13 | -0.08 | 0.05 | 0.13 | -0.08 |
| Unknown | 0.13 | 0.13 | 0.00 | 0.14 | 0.13 | 0.01 | 0.11 | 0.13 | -0.02 |
| White | | | | | | | | | |
| Less than $3,000 | 0.21 | 0.13 | 0.08 | 0.20 | 0.12 | 0.08 | 0.21 | 0.13 | 0.08 |
| $3,000-$4,999 | 0.14 | 0.13 | 0.01 | 0.13 | 0.12 | 0.01 | 0.16 | 0.13 | 0.03 |
| $5,000-$6,999 | 0.13 | 0.13 | 0.00 | 0.14 | 0.13 | 0.01 | 0.12 | 0.13 | -0.01 |
| $7,000-$9,999 | 0.10 | 0.13 | -0.03 | 0.10 | 0.13 | -0.03 | 0.09 | 0.12 | -0.03 |
| $10,000-$14,999 | 0.08 | 0.13 | -0.05 | 0.08 | 0.13 | -0.05 | 0.08 | 0.13 | -0.05 |
| $15,000 or more | 0.05 | 0.13 | -0.08 | 0.05 | 0.13 | -0.08 | 0.05 | 0.13 | -0.08 |
| Unknown | 0.14 | 0.13 | 0.01 | 0.15 | 0.13 | 0.02 | 0.12 | 0.13 | -0.01 |
| Negro | | | | | | | | | |
| Less than $3,000 | 0.12 | 0.12 | 0.00 | 0.11 | 0.12 | -0.01 | 0.13 | 0.12 | 0.01 |
| $3,000-$4,999 | 0.15 | 0.12 | 0.03 | 0.14 | 0.12 | 0.02 | 0.16 | 0.12 | 0.04 |
| $5,000-$6,999 | 0.11 | 0.13 | -0.02 | 0.13 | 0.12 | 0.01 | 0.10 | 0.13 | -0.03 |
| $7,000-$9,999 | 0.10 | 0.12 | -0.02 | 0.11 | 0.12 | -0.01 | 0.09 | 0.12 | -0.03 |
| $10,000-$14,999 | 0.04 | 0.12 | -0.08 | 0.06 | 0.12 | -0.06 | 0.03 | 0.12 | -0.09 |
| $15,000 or more | - | - | - | - | - | - | - | - | - |
| Unknown | 0.08 | 0.13 | -0.05 | 0.09 | 0.12 | -0.03 | 0.06 | 0.13 | -0.07 |

[1]Includes data for "other races," which are not shown separately.

Table 4. Actual and expected average Periodontal Index for children aged 6-11 years, by sex, race, and education of head of household: United States, 1963-65

| Race and education of head of household | Both sexes | | | Boys | | | Girls | | |
|---|---|---|---|---|---|---|---|---|---|
| | Actual | Expected | Difference | Actual | Expected | Difference | Actual | Expected | Difference |
| Total[1] | | | | | | | | | |
| None or less than 5 years | 0.23 | 0.13 | 0.10 | 0.22 | 0.13 | 0.09 | 0.23 | 0.13 | 0.10 |
| 5-7 years | 0.20 | 0.13 | 0.07 | 0.20 | 0.13 | 0.07 | 0.20 | 0.13 | 0.07 |
| 8 years | 0.15 | 0.13 | 0.02 | 0.16 | 0.13 | 0.03 | 0.15 | 0.13 | 0.02 |
| 9-11 years | 0.14 | 0.12 | 0.02 | 0.14 | 0.12 | 0.02 | 0.14 | 0.12 | 0.02 |
| 12 years | 0.10 | 0.12 | -0.02 | 0.10 | 0.12 | -0.02 | 0.10 | 0.13 | -0.03 |
| 13-15 years | 0.07 | 0.12 | -0.05 | 0.07 | 0.12 | -0.05 | 0.07 | 0.12 | -0.05 |
| 16 years | 0.07 | 0.13 | -0.06 | 0.08 | 0.12 | -0.04 | 0.07 | 0.13 | -0.06 |
| 17 years or more | 0.06 | 0.13 | -0.07 | 0.06 | 0.13 | -0.07 | 0.06 | 0.13 | -0.07 |
| Unknown | 0.22 | 0.12 | 0.10 | 0.23 | 0.12 | 0.11 | 0.22 | 0.13 | 0.09 |
| White | | | | | | | | | |
| None or less than 5 years | 0.26 | 0.13 | 0.13 | 0.27 | 0.13 | 0.14 | 0.26 | 0.13 | 0.13 |
| 5-7 years | 0.22 | 0.13 | 0.09 | 0.21 | 0.13 | 0.08 | 0.24 | 0.13 | 0.11 |
| 8 years | 0.15 | 0.13 | 0.02 | 0.15 | 0.13 | 0.02 | 0.14 | 0.13 | 0.01 |
| 9-11 years | 0.15 | 0.13 | 0.02 | 0.15 | 0.13 | 0.02 | 0.14 | 0.12 | 0.02 |
| 12 years | 0.10 | 0.13 | -0.03 | 0.10 | 0.13 | -0.03 | 0.10 | 0.13 | -0.03 |
| 13-15 years | 0.07 | 0.12 | -0.05 | 0.07 | 0.13 | -0.06 | 0.06 | 0.12 | -0.06 |
| 16 years | 0.07 | 0.13 | -0.06 | 0.08 | 0.13 | -0.05 | 0.06 | 0.13 | -0.07 |
| 17 years or more | 0.06 | 0.13 | -0.07 | 0.06 | 0.13 | -0.07 | 0.07 | 0.13 | -0.06 |
| Unknown | 0.29 | 0.12 | 0.17 | 0.28 | 0.12 | 0.16 | 0.30 | 0.13 | 0.17 |
| Negro | | | | | | | | | |
| None or less than 5 years | 0.13 | 0.12 | 0.01 | 0.08 | 0.11 | -0.03 | 0.18 | 0.13 | 0.05 |
| 5-7 years | 0.17 | 0.13 | 0.05 | 0.17 | 0.13 | 0.04 | 0.16 | 0.13 | 0.03 |
| 8 years | 0.19 | 0.12 | 0.07 | 0.18 | 0.12 | 0.06 | 0.20 | 0.12 | 0.08 |
| 9-11 years | 0.10 | 0.12 | -0.02 | 0.09 | 0.11 | -0.02 | 0.10 | 0.13 | -0.03 |
| 12 years | 0.07 | 0.12 | -0.05 | 0.10 | 0.12 | -0.02 | 0.04 | 0.12 | -0.08 |
| 13-15 years | 0.11 | 0.13 | -0.02 | 0.08 | 0.13 | -0.05 | 0.16 | 0.13 | 0.03 |
| 16 years | 0.07 | 0.12 | -0.05 | 0.10 | 0.12 | -0.02 | 0.02 | 0.13 | -0.11 |
| 17 years or more | 0.08 | 0.14 | -0.06 | 0.17 | 0.15 | 0.02 | 0.05 | 0.13 | -0.08 |
| Unknown | 0.10 | 0.12 | -0.02 | 0.14 | 0.12 | 0.02 | 0.08 | 0.13 | -0.05 |

[1]Includes data for "other races," which are not shown separately.

Table 5. Actual and expected average Periodontal Index for children aged 6-11 years, by sex, race, and geographic region: United States, 1963-65

| Race and geographic region | Both sexes | | | Boys | | | Girls | | |
|---|---|---|---|---|---|---|---|---|---|
| | Actual | Expected | Difference | Actual | Expected | Difference | Actual | Expected | Difference |
| Total[1] | | | | | | | | | |
| Northeast | 0.17 | 0.12 | 0.05 | 0.18 | 0.12 | 0.06 | 0.17 | 0.12 | 0.05 |
| Midwest | 0.09 | 0.13 | -0.04 | 0.09 | 0.13 | -0.04 | 0.08 | 0.13 | -0.05 |
| South | 0.18 | 0.13 | 0.05 | 0.16 | 0.12 | 0.04 | 0.20 | 0.13 | 0.07 |
| West | 0.07 | 0.12 | -0.05 | 0.07 | 0.13 | -0.06 | 0.06 | 0.12 | -0.06 |
| White | | | | | | | | | |
| Northeast | 0.18 | 0.12 | 0.06 | 0.19 | 0.13 | 0.06 | 0.18 | 0.12 | 0.06 |
| Midwest | 0.09 | 0.13 | -0.04 | 0.09 | 0.13 | -0.04 | 0.08 | 0.13 | -0.05 |
| South | 0.19 | 0.13 | 0.06 | 0.17 | 0.12 | 0.05 | 0.21 | 0.13 | 0.08 |
| West | 0.07 | 0.13 | -0.06 | 0.07 | 0.13 | -0.06 | 0.06 | 0.12 | -0.06 |
| Negro | | | | | | | | | |
| Northeast | 0.10 | 0.12 | -0.02 | 0.10 | 0.12 | -0.02 | 0.10 | 0.13 | -0.03 |
| Midwest | 0.10 | 0.12 | -0.02 | 0.12 | 0.12 | 0.00 | 0.09 | 0.12 | -0.03 |
| South | 0.16 | 0.12 | 0.04 | 0.14 | 0.12 | 0.02 | 0.17 | 0.12 | 0.05 |
| West | 0.06 | 0.12 | -0.06 | 0.08 | 0.12 | -0.04 | 0.05 | 0.13 | -0.08 |

[1]Includes data for "other races," which are not shown separately.

Table 6. Average Simplified Oral Hygiene, Debris, and Calculus Indexes for children, by race, sex, and age: United States, 1963-65

| Sex and age | Simplified Oral Hygiene Index | | | Simplified Debris Index | | | Simplified Calculus Index | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total[1] | White | Negro | Total[1] | White | Negro | Total[1] | White | Negro |
| Both sexes | | | | | | | | | |
| 6-11 years | 1.44 | 1.41 | 1.66 | 1.42 | 1.39 | 1.61 | 0.02 | 0.02 | 0.05 |
| 6 years | 1.38 | 1.36 | 1.50 | 1.38 | 1.36 | 1.49 | 0.00 | 0.00 | 0.01 |
| 7 years | 1.50 | 1.47 | 1.70 | 1.49 | 1.46 | 1.67 | 0.01 | 0.01 | 0.03 |
| 8 years | 1.49 | 1.46 | 1.70 | 1.48 | 1.44 | 1.67 | 0.02 | 0.02 | 0.03 |
| 9 years | 1.47 | 1.43 | 1.71 | 1.44 | 1.41 | 1.66 | 0.02 | 0.02 | 0.05 |
| 10 years | 1.41 | 1.36 | 1.70 | 1.38 | 1.34 | 1.66 | 0.02 | 0.02 | 0.04 |
| 11 years | 1.40 | 1.37 | 1.64 | 1.36 | 1.33 | 1.53 | 0.05 | 0.04 | 0.11 |
| Boys | | | | | | | | | |
| 6-11 years | 1.49 | 1.45 | 1.72 | 1.47 | 1.43 | 1.67 | 0.02 | 0.02 | 0.06 |
| 6 years | 1.41 | 1.39 | 1.51 | 1.40 | 1.38 | 1.51 | 0.00 | 0.00 | 0.00 |
| 7 years | 1.54 | 1.50 | 1.77 | 1.53 | 1.50 | 1.74 | 0.01 | 0.00 | 0.03 |
| 8 years | 1.50 | 1.48 | 1.71 | 1.49 | 1.46 | 1.68 | 0.02 | 0.02 | 0.03 |
| 9 years | 1.52 | 1.47 | 1.80 | 1.49 | 1.46 | 1.73 | 0.03 | 0.02 | 0.07 |
| 10 years | 1.47 | 1.42 | 1.78 | 1.44 | 1.40 | 1.73 | 0.03 | 0.02 | 0.05 |
| 11 years | 1.49 | 1.44 | 1.78 | 1.44 | 1.41 | 1.62 | 0.05 | 0.03 | 0.16 |
| Girls | | | | | | | | | |
| 6-11 years | 1.39 | 1.36 | 1.60 | 1.38 | 1.34 | 1.56 | 0.02 | 0.02 | 0.03 |
| 6 years | 1.35 | 1.33 | 1.49 | 1.35 | 1.32 | 1.48 | 0.00 | 0.00 | 0.02 |
| 7 years | 1.46 | 1.43 | 1.63 | 1.45 | 1.42 | 1.60 | 0.01 | 0.01 | 0.03 |
| 8 years | 1.48 | 1.44 | 1.69 | 1.46 | 1.43 | 1.66 | 0.01 | 0.01 | 0.03 |
| 9 years | 1.42 | 1.38 | 1.63 | 1.39 | 1.36 | 1.59 | 0.02 | 0.02 | 0.03 |
| 10 years | 1.34 | 1.30 | 1.62 | 1.32 | 1.27 | 1.59 | 0.02 | 0.02 | 0.03 |
| 11 years | 1.32 | 1.29 | 1.50 | 1.28 | 1.25 | 1.44 | 0.04 | 0.04 | 0.06 |

[1]Includes data for "other races," which are not shown separately.

NOTE: 0.00 indicates estimate greater than zero but less than 0.005.

Table 7. Number and percent of children aged 6-11 years, by Simplified Oral Hygiene Index and sex: United States, 1963-65

| Simplified Oral Hygiene Index | Boys | Girls | Boys | Girls |
|---|---|---|---|---|
| | Number in thousands[1] | | Percent | |
| Total | 12,043 | 11,670 | 100.0 | 100.0 |
| 0.0 | 96 | 136 | 0.8 | 1.2 |
| 0.1 | - | - | - | - |
| 0.2 | 90 | 167 | 0.7 | 1.4 |
| 0.3 | 195 | 246 | 1.6 | 2.1 |
| 0.4 | 7 | 15 | 0.1 | 0.1 |
| 0.5 | 364 | 486 | 3.0 | 4.2 |
| 0.6 | 38 | 29 | 0.3 | 0.2 |
| 0.7 | 746 | 898 | 6.2 | 7.7 |
| 0.8 | 897 | 962 | 7.4 | 8.2 |
| 0.9 | 3 | - | 0.0 | - |
| 1.0 | 1,019 | 1,181 | 8.5 | 10.1 |
| 1.1 | 13 | 7 | 0.1 | 0.1 |
| 1.2 | 1,011 | 1,060 | 8.4 | 9.1 |
| 1.3 | 994 | 855 | 8.3 | 7.3 |
| 1.4 | 93 | 165 | 0.8 | 1.4 |
| 1.5 | 932 | 772 | 7.7 | 6.6 |
| 1.6 | 81 | 88 | 0.7 | 0.8 |
| 1.7 | 1,708 | 1,355 | 14.2 | 11.6 |
| 1.8 | 1,010 | 960 | 8.4 | 8.2 |
| 1.9 | 53 | 31 | 0.4 | 0.3 |
| 2.0 | 716 | 676 | 5.9 | 5.8 |
| 2.1 | 29 | - | 0.2 | - |
| 2.2 | 529 | 427 | 4.4 | 3.7 |
| 2.3 | 387 | 282 | 3.2 | 2.4 |
| 2.4 | 44 | 48 | 0.4 | 0.4 |
| 2.5 | 318 | 277 | 2.6 | 2.4 |
| 2.6 | 21 | 27 | 0.2 | 0.2 |
| 2.7 | 233 | 186 | 1.9 | 1.6 |
| 2.8 | 168 | 127 | 1.4 | 1.1 |
| 2.9 | 5 | 7 | 0.0 | 0.1 |
| 3.0 | 207 | 163 | 1.7 | 1.4 |
| 3.1 or more | 37 | 38 | 0.3 | 0.3 |

[1]Rounded to nearest thousand.

Table 8. Actual and expected average Simplified Oral Hygiene Index for children aged 6-11 years, by sex, race, and family income: United States, 1963-65

| Race and family income | Both sexes | | | Boys | | | Girls | | |
|---|---|---|---|---|---|---|---|---|---|
| | Actual | Expected | Difference | Actual | Expected | Difference | Actual | Expected | Difference |
| Total[1] | | | | | | | | | |
| Less than $3,000 | 1.69 | 1.44 | 0.25 | 1.74 | 1.49 | 0.25 | 1.65 | 1.39 | 0.26 |
| $3,000-$4,999 | 1.55 | 1.44 | 0.11 | 1.60 | 1.48 | 0.12 | 1.50 | 1.40 | 0.10 |
| $5,000-$6,999 | 1.42 | 1.44 | -0.02 | 1.45 | 1.49 | -0.04 | 1.38 | 1.39 | -0.01 |
| $7,000-$9,999 | 1.31 | 1.44 | -0.13 | 1.37 | 1.49 | -0.12 | 1.24 | 1.40 | -0.16 |
| $10,000-$14,999 | 1.26 | 1.44 | -0.18 | 1.28 | 1.49 | -0.21 | 1.23 | 1.40 | -0.17 |
| $15,000 or more | 1.21 | 1.44 | -0.23 | 1.26 | 1.49 | -0.23 | 1.16 | 1.40 | -0.24 |
| Unknown | 1.43 | 1.44 | -0.01 | 1.55 | 1.49 | 0.06 | 1.31 | 1.40 | -0.09 |
| White | | | | | | | | | |
| Less than $3,000 | 1.65 | 1.40 | 0.25 | 1.69 | 1.45 | 0.24 | 1.61 | 1.36 | 0.25 |
| $3,000-$4,999 | 1.54 | 1.41 | 0.13 | 1.58 | 1.45 | 0.13 | 1.49 | 1.36 | 0.13 |
| $5,000-$6,999 | 1.41 | 1.41 | 0.00 | 1.44 | 1.45 | -0.01 | 1.37 | 1.36 | 0.01 |
| $7,000-$9,999 | 1.29 | 1.41 | -0.12 | 1.36 | 1.45 | -0.09 | 1.22 | 1.36 | -0.14 |
| $10,000-$14,999 | 1.26 | 1.41 | -0.15 | 1.28 | 1.45 | -0.17 | 1.23 | 1.36 | -0.13 |
| $15,000 or more | 1.22 | 1.41 | -0.19 | 1.26 | 1.45 | -0.19 | 1.16 | 1.35 | -0.19 |
| Unknown | 1.43 | 1.41 | 0.02 | 1.54 | 1.45 | 0.09 | 1.32 | 1.36 | -0.04 |
| Negro | | | | | | | | | |
| Less than $3,000 | 1.79 | 1.66 | 0.13 | 1.86 | 1.73 | 0.13 | 1.72 | 1.59 | 0.13 |
| $3,000-$4,999 | 1.63 | 1.66 | -0.03 | 1.68 | 1.71 | -0.03 | 1.56 | 1.60 | -0.04 |
| $5,000-$6,999 | 1.46 | 1.67 | -0.21 | 1.53 | 1.73 | -0.20 | 1.39 | 1.61 | -0.22 |
| $7,000-$9,999 | 1.60 | 1.67 | -0.07 | 1.52 | 1.72 | -0.20 | 1.70 | 1.59 | 0.11 |
| $10,000-$14,999 | 1.39 | 1.66 | -0.27 | 1.80 | 1.67 | 0.13 | 0.85 | 1.65 | -0.80 |
| $15,000 or more | - | - | - | - | - | - | - | - | - |
| Unknown | 1.44 | 1.67 | -0.23 | 1.67 | 1.75 | -0.08 | 1.23 | 1.60 | -0.37 |

[1]Includes data for "other races," which are not shown separately.

Table 9. Actual and expected average Simplified Oral Hygiene Index for children aged 6-11 years, by sex, race, and education of head of household: United States, 1963-65

| Race and education of head of household | Both sexes | | | Boys | | | Girls | | |
|---|---|---|---|---|---|---|---|---|---|
| | Actual | Expected | Difference | Actual | Expected | Difference | Actual | Expected | Difference |
| Total[1] | | | | | | | | | |
| None or less than 5 years | 1.74 | 1.44 | 0.30 | 1.79 | 1.49 | 0.30 | 1.70 | 1.39 | 0.31 |
| 5-7 years | 1.65 | 1.44 | 0.21 | 1.69 | 1.49 | 0.20 | 1.60 | 1.40 | 0.20 |
| 8 years | 1.55 | 1.44 | 0.11 | 1.61 | 1.49 | 0.12 | 1.49 | 1.39 | 0.10 |
| 9-11 years | 1.45 | 1.44 | 0.01 | 1.49 | 1.49 | 0.00 | 1.41 | 1.40 | 0.01 |
| 12 years | 1.36 | 1.44 | -0.08 | 1.41 | 1.49 | -0.08 | 1.30 | 1.39 | -0.09 |
| 13-15 years | 1.32 | 1.45 | -0.13 | 1.34 | 1.49 | -0.15 | 1.29 | 1.40 | -0.11 |
| 16 years | 1.25 | 1.45 | -0.20 | 1.34 | 1.49 | -0.15 | 1.15 | 1.40 | -0.25 |
| 17 years or more | 1.33 | 1.44 | -0.11 | 1.35 | 1.48 | -0.13 | 1.31 | 1.40 | -0.09 |
| Unknown | 1.68 | 1.44 | 0.24 | 1.76 | 1.49 | 0.27 | 1.63 | 1.41 | 0.22 |
| White | | | | | | | | | |
| None or less than 5 years | 1.73 | 1.40 | 0.33 | 1.75 | 1.45 | 0.30 | 1.70 | 1.36 | 0.34 |
| 5-7 years | 1.55 | 1.41 | 0.14 | 1.59 | 1.45 | 0.14 | 1.51 | 1.37 | 0.14 |
| 8 years | 1.53 | 1.40 | 0.13 | 1.59 | 1.45 | 0.14 | 1.47 | 1.36 | 0.11 |
| 9-11 years | 1.42 | 1.41 | 0.01 | 1.45 | 1.45 | 0.00 | 1.38 | 1.36 | 0.02 |
| 12 years | 1.35 | 1.41 | -0.06 | 1.40 | 1.45 | -0.05 | 1.30 | 1.36 | -0.06 |
| 13-15 years | 1.31 | 1.41 | -0.10 | 1.35 | 1.46 | -0.11 | 1.28 | 1.36 | -0.08 |
| 16 years | 1.24 | 1.41 | -0.17 | 1.32 | 1.45 | -0.13 | 1.14 | 1.36 | -0.22 |
| 17 years or more | 1.33 | 1.41 | -0.08 | 1.35 | 1.44 | -0.09 | 1.31 | 1.37 | -0.06 |
| Unknown | 1.67 | 1.40 | 0.27 | 1.73 | 1.45 | 0.28 | 1.63 | 1.37 | 0.26 |
| Negro | | | | | | | | | |
| None or less than 5 years | 1.77 | 1.66 | 0.11 | 1.87 | 1.72 | 0.15 | 1.67 | 1.59 | 0.08 |
| 5-7 years | 1.82 | 1.67 | 0.15 | 1.85 | 1.73 | 0.12 | 1.78 | 1.59 | 0.19 |
| 8 years | 1.68 | 1.64 | 0.04 | 1.76 | 1.73 | 0.03 | 1.62 | 1.58 | 0.04 |
| 9-11 years | 1.60 | 1.66 | -0.06 | 1.66 | 1.72 | -0.06 | 1.55 | 1.60 | -0.05 |
| 12 years | 1.48 | 1.66 | -0.18 | 1.57 | 1.71 | -0.14 | 1.38 | 1.60 | -0.22 |
| 13-15 years | 1.36 | 1.69 | -0.33 | 1.27 | 1.73 | -0.46 | 1.51 | 1.63 | -0.12 |
| 16 years | 1.53 | 1.70 | -0.17 | 1.59 | 1.72 | -0.13 | 1.44 | 1.67 | -0.23 |
| 17 years or more | 1.54 | 1.66 | -0.12 | 1.36 | 1.74 | -0.38 | 1.61 | 1.63 | -0.02 |
| Unknown | 1.75 | 1.66 | 0.09 | 1.93 | 1.75 | 0.18 | 1.63 | 1.60 | 0.03 |

[1]Includes data for "other races," which are not shown separately.

Table 10. Actual and expected average Simplified Oral Hygiene Index for children aged 6-11 years, by sex, race, and geographic region: United States, 1963-65

| Race and geographic region | Both sexes | | | Boys | | | Girls | | |
|---|---|---|---|---|---|---|---|---|---|
| | Actual | Expected | Difference | Actual | Expected | Difference | Actual | Expected | Difference |
| Total[1] | | | | | | | | | |
| Northeast | 1.43 | 1.44 | -0.01 | 1.50 | 1.49 | 0.01 | 1.35 | 1.40 | -0.05 |
| Midwest | 1.29 | 1.44 | -0.15 | 1.33 | 1.49 | -0.16 | 1.25 | 1.40 | -0.15 |
| South | 1.54 | 1.44 | 0.10 | 1.59 | 1.49 | 0.10 | 1.49 | 1.39 | 0.10 |
| West | 1.54 | 1.44 | 0.10 | 1.56 | 1.49 | 0.07 | 1.51 | 1.39 | 0.12 |
| White | | | | | | | | | |
| Northeast | 1.42 | 1.41 | 0.01 | 1.49 | 1.45 | 0.04 | 1.35 | 1.37 | -0.02 |
| Midwest | 1.28 | 1.41 | -0.13 | 1.32 | 1.45 | -0.13 | 1.24 | 1.36 | -0.12 |
| South | 1.41 | 1.40 | 0.01 | 1.46 | 1.45 | 0.01 | 1.36 | 1.36 | 0.00 |
| West | 1.54 | 1.41 | 0.13 | 1.56 | 1.45 | 0.11 | 1.52 | 1.36 | 0.16 |
| Negro | | | | | | | | | |
| Northeast | 1.49 | 1.66 | -0.17 | 1.61 | 1.73 | -0.12 | 1.39 | 1.60 | -0.21 |
| Midwest | 1.40 | 1.66 | -0.26 | 1.47 | 1.73 | -0.26 | 1.34 | 1.60 | -0.26 |
| South | 1.87 | 1.66 | 0.21 | 1.89 | 1.72 | 0.17 | 1.84 | 1.59 | 0.25 |
| West | 1.51 | 1.65 | -0.14 | 1.62 | 1.71 | -0.09 | 1.40 | 1.60 | -0.20 |

[1]Includes data for "other races," which are not shown separately.

# APPENDIX I

## THE DENTAL EXAMINATION

The periodontal disease status and oral hygiene status of the sample children who participated in the health examinations conducted during 1963-65 were assessed by the Periodontal Index[3] and the Simplified Oral Hygiene Index,[4] respectively. The procedures for scoring and calculating the two indexes follow, as described in references 3 and 4.

### The Periodontal Index (PI)

Scores are assigned according to these criteria:

0 Negative. There is neither overt inflammation in the investing tissues nor loss of function due to destruction of supporting tissues.

1 Mild gingivitis. There is an overt area of inflammation in the free gingivae, but the area does not circumscribe the tooth.

2 Gingivitis. Inflammation completely circumscribes the tooth, but there is no apparent break in the epithelial attachment.

6 Gingivitis with pocket formation. The epithelial attachment has been broken and there is a pocket (not merely a deepened gingival crevice due to swelling in the free gingivae). There is no interference with normal masticatory function; the tooth is firm in its socket and has not drifted.

8 Advanced destruction with loss of masticatory function. The tooth may be loose; may have drifted; may sound dull on percussion with a metallic instrument.

RULE: When in doubt, assign the lesser score.

Each tooth present in the mouth, unless it is a root, is scored, and the arithmetic average of all scores is the individual's PI.

### The Simplified Oral Hygiene Index (OHI-S)

Selected surfaces of six teeth are used in making this estimation of oral hygiene status. For the purposes of this examination each surface that is used, buccal or lingual, is considered to encompass half of the circumference of the tooth. The buccal surface of a molar, for example, is considered to include half of the mesial surface and half of the distal.

On both sides of the arch the posterior tooth assessed is the most anterior fully erupted permanent molar or, in its absence, the most distal fully erupted primary molar. In most cases this will be a first permanent molar, but in others it may be a first or second primary molar or a second permanent molar. The buccal surfaces of upper molars and the lingual of lowers are examined. In the anterior portion of the mouth, the labial surfaces of the upper right central incisor and the lower left central incisor are examined. When these teeth are missing, only the adjacent central incisor is examined.

*Examining for oral debris.*—The surface area covered by debris is estimated by running a number five explorer along the surface being examined and noting the occlusal or incisal extent of the debris as it is removed from the tooth surface and adheres to the explorer.

Scores are assigned according to the following criteria:

0 No debris or stain present.

1 (a) Soft debris covering not more than the gingival third of the tooth surface, or (b) the presence of extrinsic stains without debris regardless of surface area covered.

2 Soft debris covering more than one-third but not more than two-thirds of the exposed tooth surface.

3 Soft debris covering more than two-thirds of the exposed tooth surface.

*Examining for oral calculus.*—A number five explorer is also used to estimate surface area covered by supragingival calculus and to probe for subgingival calculus.

Scores are assigned according to the following criteria:

0 No calculus present.

1 Supragingival calculus covering not more than one-third of the exposed tooth surface.

NOTE: The list of references follows the text.

2 Supragingival calculus covering more than one-third but not more than two-thirds of the exposed tooth surface, and/or the presence of individual flecks of subgingival calculus around the cervical portion of the tooth.

3 Supragingival calculus covering more than two-thirds of the exposed tooth surface and/or a continuous heavy band of subgingival calculus around the cervical portion of the tooth.

*Calculating the index.*—The debris scores are totaled and divided by the number of surfaces scored to obtain the Simplified Debris Index. The Simplified Calculus Index is determined similarly. The debris and calculus scores are then added to give the Simplified Oral Hygiene Index.

### Training of Examiners

Each of the 7,109 sample children who received dental examinations during 1963-65 was examined by one of five dentists. The dentists included two senior examiners, A and B, who trained and supervised the other examiners, C, D, and E.

Sample children were not assigned randomly or equally among the various examiners. At most survey locations children were examined by only one dentist—C, D, or E. At 14 of 40 locations, however, a small subsample was examined by either A or B or, as occurred at three locations, by both A and B. Thus, the senior dentists examined relatively few sample children. The number and percent of children examined by each dentist were as follows:

| Examiner | Number of sample children examined | Percent of sample children examined |
|---|---|---|
| All examiners- | 7,109 | 100.0 |
| A---------- | 467 | 6.6 |
| B---------- | 394 | 5.5 |
| C---------- | 3,200 | 45.0 |
| D---------- | 2,188 | 30.8 |
| E---------- | 860 | 12.1 |

Most examinations completed by the senior dentists resulted from a planned series of replicate examinations. As a rule, the findings of the senior dentists were included in the sample child's examination record, and the findings of the dentist with whom he was paired were kept separate. The primary aim of the replicate examinations was to correct any examiner divergence from the accepted examination procedures.

Table I. Percent distribution of differences in the Periodontal Index between senior dentists and other dentists on 393 replicate dental examinations: Health Examination Survey, 1963-65

| Difference in Periodontal Index | Examiner | | | |
|---|---|---|---|---|
| | C, D, E, | C. | D | E |
| | Percent distribution | | | |
| All replicate examinations-- | 100.0 | 100.0 | 100.0 | 100.0 |
| -0.6 to -1.2--------- | 1.2 | 1.6 | 0.0 | 0.0 |
| -0.5---------- | 1.0 | 1.2 | 1.3 | 0.0 |
| -0.4---------- | 2.3 | 1.6 | 1.3 | 6.0 |
| -0.3---------- | 2.8 | 2.0 | 3.9 | 4.5 |
| -0.2---------- | 6.4 | 4.4 | 5.3 | 14.9 |
| -0.1---------- | 10.9 | 10.0 | 10.5 | 14.9 |
| 0.0---------- | 44.0 | 48.0 | 46.1 | 26.9 |
| +0.1---------- | 16.3 | 16.0 | 13.2 | 20.9 |
| +0.2---------- | 6.6 | 6.8 | 9.2 | 3.0 |
| +0.3---------- | 3.8 | 3.2 | 5.3 | 4.5 |
| +0.4---------- | 2.5 | 2.0 | 3.9 | 3.0 |
| +0.5---------- | 1.3 | 2.0 | 0.0 | 0.0 |
| +0.6 to +1.2--------- | 1.1 | 1.2 | 0.0 | 1.5 |

Throughout the replicate examinations, while the other dentist was absent, the senior dentist completed his examination first, dictating his findings to a trained recorder. Then the other dentist completed his examination, and the senior dentist recorded these findings. Appreciable interexaminer differences as well as any procedure that diverged from the accepted one were discussed and, if indicated, either resolved or corrected while the sample child was still present. However, the findings originally recorded by the examiner were not altered.

To indicate the level of agreement on the PI, the results of the replicate examinations are shown in table I. The direction of the disagreements that occurred is shown by positive or negative numbers. A positive number indicates that a finding of the senior dentist was higher than that of the other dentist, while a negative number indicates the opposite.

The data suggest that the level of agreement between senior dentists and other dentists was relatively high. Perfect agreement resulted in 44 percent of the examinations, and about 71 percent of the periodontal scores differed by no more than 0.1. The differences ranged as high as 1.2, but differences greater than 0.2 occurred in only about 16 percent of the examinations. The distribution also suggests that the senior dentists generally tended to assign somewhat higher scores than did the other examiners, with about 32 percent of the differences positive and about 25 percent negative.

Table I also gives the percent distribution of differences between the PI's assigned by examiners C, D, and E individually and those assigned by the senior examiners. Examiner E achieved perfect agreement less often than did examiners C and D. Examiners C and D were lower than the senior examiners in about 31 percent of the replicates and higher in about 21 percent. By contrast, examiner E was lower about 33 percent of the time and higher about 40 percent of the time.

Results of the replicate oral hygiene findings were also examined. They are not presented here because the procedure for determining the OHI-S (drawing an explorer along the surfaces of specified teeth) systematically biases the findings of a replicate examination by removing at least some of any debris that is present.

## APPENDIX II

## DEMOGRAPHIC AND SOCIOECONOMIC TERMS

*Age.*—The age recorded for each child was the age at his last birthday on the date of examination. The age criterion for inclusion in the sample used in this survey was defined in terms of age at the time of the interview prior to the examination. Since the examination usually took place 2 to 4 weeks after the interview, some of those who were 11 years old at the time of interview became 12 years old by the time of examination. There were 72 such cases. In the adjustment and weighting procedures used to produce national estimates, these 72 were included in the 11-year-old group.

*Race.*—Race was recorded as "white," "Negro," or "other races." The last category included American Indians, Chinese, Japanese, and all races other than white or Negro. Mexican persons were included with "white" unless definitely known to be American Indian or of another race. Negroes and persons of mixed Negro and other parentage were recorded as "Negro."

*Family income.*—The income recorded was the total income received during the past 12 months by the head of the household and all other household members related to the head by blood, marriage, or adoption. This income was the gross cash income (excluding pay in kind, e.g., meals, living quarters, or supplies provided in place of cash wages) except when a family had its own farm or business, in which case net income was recorded.

*Education of head of household.*—The highest grade completed in school was recorded. The only grades counted were those completed in a regular public or private school in which persons received formal education, either during the day or at night, with either full-time or part-time attendance. A regular school is one which advances a person toward an elementary or high school diploma or toward a college, university, or professional school degree. Education in vocational, trade, or business schools outside a regular school system was not counted in determining the highest grade of school completed.

*Geographic region.*—For purposes of stratification the United States was divided into four broad geographic regions of approximately equal population. These regions, which correspond closely to those used by the U.S. Bureau of the Census, were as follows:[9]

| *Region* | *States Included* |
|---|---|
| Northeast | Maine, Vermont, New Hampshire, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, and Pennsylvania |
| Midwest | Ohio, Illinois, Indiana, Michigan, Wisconsin, Minnesota, Iowa, and Missouri |
| South | Delaware, Maryland, District of Columbia, West Virginia, Virginia, Kentucky, Tennessee, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Arkansas |
| West | Washington, Oregon, California, Nevada, New Mexico, Arizona, Texas, Oklahoma, Kansas, Nebraska, North Dakota, South Dakota, Idaho, Utah, Colorado, Montana, Wyoming, Alaska, and Hawaii |

NOTE: The list of references follows the text.

# APPENDIX III

# STATISTICAL NOTES

## The Survey Design

The sample design for the second cycle of the Health Examination Survey, similar to the one used for the first cycle, was that of a multistage, stratified probability sample of loose clusters of persons in land-based segments. Successive elements dealt with in the process of sampling were the primary sampling unit (PSU), census enumeration district (ED), segment, household, eligible child (EC), and, finally, the sample child (SC).

At the first stage the nearly 2,000 PSU's into which the United States (including Hawaii and Alaska) had been divided and then grouped into 357 strata for use in the Current Population Survey and the Health Interview Survey were further grouped into 40 superstrata for use in Cycle II of the Health Examination Survey. The average size of each Cycle II stratum was 4.5 million persons, and all strata fell between the limits of 3.5 and 5.5 million. Grouping into 40 strata was done in a way that maximized homogeneity of the PSU's included in each stratum, particularly with regard to degree of urbanization, geographic proximity, and degree of industrialization. The 40 strata were classified into four broad geographic regions (each with 10 strata) of approximately equal population and cross-classified into four broad population density groups (each having 10 strata). Each of the 16 cells contained either two or three strata. A single stratum might include only one PSU, only part of a PSU (for example, New York City, which represented two strata), or several score PSU's.

To account for the possible effect that the rate of population change between the 1950 and 1960 censuses might have had on health, the 10 strata within each geographic region were further classified into four classes ranging from those with no increase to those with the greatest relative increase. Each such class contained either two or three strata.

One PSU was then selected from each of the 40 strata. A controlled selection technique was used in which the probability of selection of a particular PSU was proportional to its 1960 population. In the controlled selection an attempt was also made to maximize the spread of the PSU's among the States. While not every one of the 64 cells in the 4 x 4 x 4 grid contributed a PSU to the sample of 40 PSU's, the controlled selection technique ensured the sample's matching the marginal distributions in all three dimensions and being closely representative of all cross-classifications.

Generally, within a particular PSU, 20 ED's were selected with the probability of selection of a particular ED proportional to its population in the age group 5-9 years in the 1960 census, which by 1963 roughly approximated the population in the target age group for Cycle II. A similar method was used for selecting one segment (a cluster of households) in each ED. Each of the resultant 20 segments was either a bounded area or a cluster of households (or addresses). All children in the age range properly resident at the address visited were EC's. Operational considerations made it necessary to reduce the number of prospective examinees at any one location to a maximum of 200. The EC's to be excluded for this reason from the SC group were determined by systematic subsampling.

The total sample included 7,417 children from 25 different States in the age group 6-11 years, with approximately 1,000 at each of the single years of age.[9]

## Reliability

Measurement processes employed in the survey were highly standardized and closely controlled. Of course this does not mean that the correspondence between the real world and the survey results is exact. Data from the survey are imperfect for three major reasons: (1) results are subject to sampling error, (2) the actual conduct of a survey never agrees perfectly with the design, and (3) the measurement processes themselves are inexact even though standardized and controlled.

The first report on Cycle II[1] describes in detail the faithfulness with which the sampling design was carried out. It notes that of the 7,417 sample children, the 7,119 who were examined—a response rate of 96 percent—gave evidence that they were a highly representative sample of children of this age in the noninsti-

NOTE: The list of references follows the text.

tutionalized population of the United States. The response levels for the various demographic subgroups—including those for age, sex, race, region, population density, parent's educational level, and family income—showed no marked differentials. Hence, it appears unlikely that nonresponse could bias the findings much in these respects.

Data recorded for each sample child were inflated in the estimation process to characterize the larger universe of which the sample child was representative. The weights used in this inflation process were a product of the reciprocal of the probability of selecting the child, an adjustment for nonresponse cases, and a poststratified ratio adjustment which increased precision by bringing survey results into closer alignment with known U.S. population figures by race and sex for single years of age from 6 through 11.

In the second cycle of the Health Examination Survey the sample was the result of three stages of selection—the single PSU from each stratum, the 20 segments from each sample PSU, and the sample children from the eligible children. The probability of selecting an individual child was the product of the probability of selection at each stage.

Since the strata were roughly equal in population size and a nearly equal number of sample children were examined in each of the sample PSU's, the sample design was essentially self-weighting with respect to the target population; that is, each child 6-11 years old had about the same probability of being drawn into the sample.

Only 10 examined sample children did not receive a dental examination. Thus, dental findings were recorded for 7,109 children who are classified in table II by age and sex. The estimated U.S. population aged 6-11 years by race, sex, and age is shown in table III.

### Sampling and Measurement Error

In this report and its appendixes several references have been made to efforts to evaluate both bias and variability of the measurement techniques. The probability design of the survey makes possible the calculation of sampling errors. The sampling error is used here to determine how imprecise the survey test results may be because they come from a sample rather than from all elements in the universe.

The estimation of sampling errors for a study of the type of the Health Examination Survey is complicated by at least three factors: (1) measurement error and "pure" sampling error are confounded in the data—it is not easy to find a procedure which will either completely include both or treat one or the other separately; (2) the survey design and estimation procedure are complex and accordingly require computationally involved techniques for calculation of variances; and (3) thousands of statistics come from the survey, many for subclasses of the population for which there are small numbers of sample cases. Estimates of sampling error are obtained from the sample data and are themselves subject to sampling error, which may be large when the number of cases in a cell is small, or even occasionally when the number of cases is substantial.

In the present report estimates of approximate sampling variability for selected statistics are presented in tables IV-XI. These estimates have been prepared by a replication technique which yields overall variability through observation of variability among random subsamples of the total sample. The method reflects both "pure" sampling variance and a part of the measurement variance. A similar pseudoreplication technique was used to estimate the standard errors of the correlation coefficients shown in the Discussion section.[10]

NOTE: The list of references follows the text.

Table II. Number of examined sample children who received a dental examination, by sex and age: Health Examination Survey, 1963-65

| Age | Number of boys | Number of girls |
|---|---|---|
| 6-11 years | 3,626 | 3,483 |
| 6 years | 574 | 535 |
| 7 years | 631 | 607 |
| 8 years | 617 | 613 |
| 9 years | 601 | 581 |
| 10 years | 575 | 583 |
| 11 years | 628 | 564 |

Table III. Estimated number of noninstitutionalized children, by race, sex, and age: United States, 1963-65

| Age | Total[1] | White | | Negro | |
|---|---|---|---|---|---|
| | | Boys | Girls | Boys | Girls |
| | Number in thousands | | | | |
| 6-11 years | 23,784 | 10,391 | 10,012 | 1,642 | 1,629 |
| 6 years | 4,098 | 1,787 | 1,722 | 289 | 281 |
| 7 years | 4,084 | 1,781 | 1,716 | 286 | 284 |
| 8 years | 3,986 | 1,739 | 1,674 | 279 | 281 |
| 9 years | 3,957 | 1,730 | 1,663 | 269 | 265 |
| 10 years | 3,867 | 1,692 | 1,632 | 264 | 266 |
| 11 years | 3,792 | 1,662 | 1,605 | 255 | 253 |

[1]Includes data for "other races," which are not shown separately.

SOURCE: Adapted from data provided by the U.S. Bureau of the Census.

Table IV. Standard errors of estimates of the average Periodontal Index for children, by sex, race, and age: United States, 1963-65

| Age | Both sexes | | | Boys | | | Girls | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total[1] | White | Negro | Total[1] | White | Negro | Total[1] | White | Negro |
| 6-11 years | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.01 |
| 6 years | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.03 | 0.01 | 0.01 | 0.02 |
| 7 years | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 |
| 8 years | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.03 | 0.01 | 0.02 | 0.04 |
| 9 years | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.03 | 0.02 | 0.03 | 0.02 |
| 10 years | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.03 |
| 11 years | 0.02 | 0.02 | 0.02 | 0.02 | 0.03 | 0.02 | 0.02 | 0.02 | 0.03 |

[1]Includes data for "other races," which are not shown separately.

Table V. Standard errors of estimates of the average Periodontal Index for children aged 6-11 years, by sex, race, and family income: United States, 1963-65

| Family income | Both sexes | | | Boys | | | Girls | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total[1] | White | Negro | Total[1] | White | Negro | Total[1] | White | Negro |
| Less than $3,000 | 0.03 | 0.04 | 0.01 | 0.03 | 0.04 | 0.03 | 0.04 | 0.06 | 0.02 |
| $3,000-$4,999 | 0.01 | 0.01 | 0.02 | 0.01 | 0.02 | 0.02 | 0.01 | 0.01 | 0.02 |
| $5,000-$6,999 | 0.02 | 0.02 | 0.03 | 0.02 | 0.02 | 0.04 | 0.02 | 0.02 | 0.03 |
| $7,000-$9,999 | 0.01 | 0.01 | 0.03 | 0.01 | 0.02 | 0.03 | 0.01 | 0.01 | 0.04 |
| $10,000-$14,999 | 0.01 | 0.01 | 0.04 | 0.01 | 0.01 | 0.06 | 0.01 | 0.01 | 0.07 |
| $15,000 or more | 0.01 | 0.01 | - | 0.01 | 0.01 | - | 0.01 | 0.01 | - |
| Unknown | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 | 0.05 | 0.02 | 0.03 | 0.03 |

[1]Includes data for "other races," which are not shown separately.

### Expected Values

In tables 3-5 the actual mean PI per person and in tables 8-10 the actual mean OHI-S per person are compared with expected estimates. The computation of expected rates was done as follows:

> Suppose it is estimated that in a subgroup there are $N_i$ persons in the $i^{th}$ age group ($i = 1, 2, \ldots 7$; sum of $N_i = N$). Suppose it is estimated that the mean PI per person for the United States in the $i^{th}$ age-sex group is $X_i$. Then the expected mean PI for the subgroup is
>
> $$\frac{1}{N} \sum_i N_i \overline{X_i}$$

Comparison of an actual value for, say, a region with the expected value for that region is undertaken on the assumption that a meaningful statement can be made which holds, in some average way, for all persons who are in the region. This may or may not be true. The specified region may have higher values for younger children and lower values for older children than those found in other regions. In that case an average comparison would obliterate one or both of these differentials.

In arriving at the general conclusions expressed in the text, an effort was made to consider all the specific data, including data not presented in this report, but it must be recognized that balancing such evidence is a qualitative exercise rather than a quantitative one. The standard error of the difference between an actual and expected value may be approximated by the standard error of the actual value (tables V-VII and IX-XI).

### Small Numbers

In some tables magnitudes are shown for cells for which the sample size is so small that the sampling error may be several times as great as the statistic itself. Obviously in such instances the statistic has no meaning in itself except to indicate that the true quantity is small. Such numbers, if shown, have been included to convey an impression of the overall story of the table.

Table VI. Standard errors of estimates of the average Periodontal Index for children aged 6-11 years, by sex, race, and education of head of household: United States, 1963-65

| Education of head of household | Both sexes | | | Boys | | | Girls | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total[1] | White | Negro | Total[1] | White | Negro | Total[1] | White | Negro |
| None or less than 5 years | 0.03 | 0.05 | 0.04 | 0.02 | 0.04 | 0.03 | 0.05 | 0.07 | 0.05 |
| 5-7 years | 0.02 | 0.03 | 0.01 | 0.02 | 0.03 | 0.02 | 0.03 | 0.05 | 0.02 |
| 8 years | 0.02 | 0.02 | 0.03 | 0.02 | 0.03 | 0.04 | 0.02 | 0.02 | 0.04 |
| 9-11 years | 0.01 | 0.02 | 0.01 | 0.02 | 0.02 | 0.02 | 0.01 | 0.02 | 0.02 |
| 12 years | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.03 | 0.01 | 0.02 | 0.02 |
| 13-15 years | 0.01 | 0.01 | 0.03 | 0.01 | 0.01 | 0.03 | 0.01 | 0.01 | 0.03 |
| 16 years | 0.02 | 0.02 | 0.06 | 0.02 | 0.02 | 0.08 | 0.02 | 0.02 | 0.03 |
| 17 years or more | 0.01 | 0.01 | 0.06 | 0.01 | 0.01 | 0.12 | 0.02 | 0.02 | 0.06 |
| Unknown | 0.06 | 0.09 | 0.04 | 0.08 | 0.13 | 0.06 | 0.06 | 0.08 | 0.05 |

[1]Includes data for "other races," which are not shown separately.

Table VII. Standard errors of estimates of the average Periodontal Index for children aged 6-11 years, by sex, race, and geographic region: United States, 1963-65

| Geographic region | Both sexes | | | Boys | | | Girls | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total[1] | White | Negro | Total[1] | White | Negro | Total[1] | White | Negro |
| Northeast | 0.04 | 0.05 | 0.04 | 0.04 | 0.05 | 0.04 | 0.04 | 0.04 | 0.04 |
| Midwest | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.03 | 0.01 | 0.01 | 0.04 |
| South | 0.03 | 0.04 | 0.02 | 0.03 | 0.03 | 0.03 | 0.04 | 0.05 | 0.02 |
| West | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |

[1]Includes data for "other races," which are not shown separately.

### Tests of Significance

Tests of significance for mean periodontal and simplified oral hygiene scores per person by selected demographic characteristics are performed in two ways. The first is to determine if the difference between two estimated means is equal to or greater than two times the standard error of the difference. The test assumes, in accordance with usual practice, that a 68-percent confidence interval ranges within one standard error of the tabulated statistics and that a 95-percent confidence interval ranges within two standard errors. An approximation of the standard error of the difference $d = x - y$ of two statistics $x$ and $y$ is given by the formula $S_d = (S_x^2 + S_y^2)^{1/2}$ where $S_x$ and $S_y$ are standard errors, respectively, of $x$ and $y$, shown in tables IV-XI. For example, table 2 shows that the mean PI is 0.08 for white boys aged 6 and 0.16 for white boys aged 11, while from table IV the standard error of the estimated mean for white boys aged 6 is 0.01 and that of boys aged 11 is 0.03. The formula yields an estimated standard error of the difference $(d = -0.08)$ of $S_d = 0.0316$. Thus, as the observed difference is more than twice its sampling error, it can be concluded that the mean PI for white boys aged 6 is significantly lower than that for white boys aged 11.

The second test is to determine if the difference between the estimated actual and expected values is at least two times the standard error of the actual value. For example, for white boys from families with less than $3,000 yearly income, the difference between the actual and expected mean periodontal scores is 0.08 (table 3), and the standard error of the actual is 0.04 (table V). Since the difference is twice the standard error, it may be deemed statistically significant.

The criterion for significance among geographical regions was more stringent than that for other demographic characteristics. To determine whether the difference between estimated means for children in any two of the four geographic regions was significant, the difference was required to be at least 2.5 times the standard error.

Table VIII. Standard errors of estimates of the average Simplified Oral Hygiene, Debris, and Calculus Indexes for children, by race, sex, and age: United States, 1963-65

| Sex and age | Simplified Oral Hygiene Index | | | Simplified Debris Index | | | Simplified Calculus Index | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total[1] | White | Negro | Total[1] | White | Negro | Total[1] | White | Negro |
| Both sexes | | | | | | | | | |
| 6-11 years | 0.042 | 0.044 | 0.108 | 0.043 | 0.044 | 0.102 | 0.002 | 0.001 | 0.008 |
| 6 years | 0.049 | 0.050 | 0.126 | 0.048 | 0.050 | 0.121 | 0.001 | 0.000 | 0.006 |
| 7 years | 0.043 | 0.043 | 0.083 | 0.042 | 0.043 | 0.084 | 0.002 | 0.002 | 0.008 |
| 8 years | 0.054 | 0.057 | 0.111 | 0.054 | 0.058 | 0.104 | 0.003 | 0.003 | 0.011 |
| 9 years | 0.044 | 0.040 | 0.161 | 0.044 | 0.041 | 0.151 | 0.003 | 0.003 | 0.015 |
| 10 years | 0.046 | 0.050 | 0.111 | 0.046 | 0.048 | 0.115 | 0.003 | 0.004 | 0.014 |
| 11 years | 0.042 | 0.044 | 0.133 | 0.043 | 0.045 | 0.118 | 0.005 | 0.005 | 0.026 |
| Boys | | | | | | | | | |
| 6-11 years | 0.045 | 0.044 | 0.120 | 0.045 | 0.044 | 0.113 | 0.002 | 0.001 | 0.013 |
| 6 years | 0.058 | 0.056 | 0.159 | 0.058 | 0.056 | 0.159 | 0.000 | 0.000 | 0.003 |
| 7 years | 0.052 | 0.049 | 0.133 | 0.052 | 0.048 | 0.136 | 0.002 | 0.002 | 0.011 |
| 8 years | 0.055 | 0.060 | 0.070 | 0.055 | 0.059 | 0.073 | 0.004 | 0.004 | 0.009 |
| 9 years | 0.050 | 0.039 | 0.233 | 0.048 | 0.040 | 0.205 | 0.006 | 0.005 | 0.031 |
| 10 years | 0.049 | 0.052 | 0.125 | 0.049 | 0.050 | 0.129 | 0.004 | 0.005 | 0.022 |
| 11 years | 0.049 | 0.049 | 0.168 | 0.049 | 0.051 | 0.143 | 0.009 | 0.007 | 0.053 |
| Girls | | | | | | | | | |
| 6-11 years | 0.042 | 0.046 | 0.098 | 0.042 | 0.046 | 0.094 | 0.002 | 0.002 | 0.008 |
| 6 years | 0.047 | 0.052 | 0.111 | 0.046 | 0.052 | 0.102 | 0.001 | 0.000 | 0.012 |
| 7 years | 0.043 | 0.048 | 0.065 | 0.042 | 0.046 | 0.066 | 0.004 | 0.004 | 0.012 |
| 8 years | 0.061 | 0.063 | 0.187 | 0.060 | 0.064 | 0.169 | 0.004 | 0.003 | 0.021 |
| 9 years | 0.048 | 0.050 | 0.118 | 0.048 | 0.050 | 0.121 | 0.003 | 0.003 | 0.011 |
| 10 years | 0.049 | 0.055 | 0.108 | 0.048 | 0.053 | 0.113 | 0.005 | 0.005 | 0.019 |
| 11 years | 0.042 | 0.046 | 0.115 | 0.042 | 0.045 | 0.117 | 0.008 | 0.008 | 0.020 |

[1]Includes data for "other races," which are not shown separately.

NOTE: 0.000 indicates standard error greater than zero but less than 0.0005.

Table IX. Standard errors of estimates of the average Simplified Oral Hygiene Index for children aged 6-11 years, by sex, race, and family income: United States, 1963-65

| Family income | Both sexes | | | Boys | | | Girls | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total[1] | White | Negro | Total[1] | White | Negro | Total[1] | White | Negro |
| Less than $3,000 | 0.06 | 0.05 | 0.12 | 0.06 | 0.05 | 0.13 | 0.06 | 0.06 | 0.12 |
| $3,000-$4,999 | 0.06 | 0.06 | 0.14 | 0.07 | 0.06 | 0.17 | 0.06 | 0.07 | 0.10 |
| $5,000-$6,999 | 0.05 | 0.05 | 0.06 | 0.05 | 0.05 | 0.08 | 0.05 | 0.05 | 0.09 |
| $7,000-$9,999 | 0.04 | 0.04 | 0.09 | 0.05 | 0.05 | 0.10 | 0.04 | 0.04 | 0.13 |
| $10,000-$14,999 | 0.05 | 0.05 | 0.20 | 0.05 | 0.05 | 0.08 | 0.06 | 0.06 | 0.29 |
| $15,000 or more | 0.05 | 0.05 | - | 0.06 | 0.06 | - | 0.08 | 0.08 | - |
| Unknown | 0.04 | 0.05 | 0.12 | 0.06 | 0.06 | 0.10 | 0.05 | 0.05 | 0.17 |

[1]Includes data for "other races," which are not shown separately.

Table X. Standard errors of estimates of the average Simplified Oral Hygiene Index for children aged 6-11 years, by sex, race, and education of head of household: United States, 1963-65

| Education of head of household | Both sexes | | | Boys | | | Girls | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total[1] | White | Negro | Total[1] | White | Negro | Total[1] | White | Negro |
| None or less than 5 years | 0.10 | 0.13 | 0.14 | 0.12 | 0.14 | 0.19 | 0.10 | 0.14 | 0.12 |
| 5-7 years | 0.09 | 0.07 | 0.18 | 0.11 | 0.10 | 0.23 | 0.07 | 0.06 | 0.13 |
| 8 years | 0.06 | 0.07 | 0.09 | 0.06 | 0.07 | 0.12 | 0.07 | 0.08 | 0.10 |
| 9-11 years | 0.05 | 0.05 | 0.11 | 0.05 | 0.05 | 0.10 | 0.05 | 0.05 | 0.15 |
| 12 years | 0.05 | 0.06 | 0.05 | 0.05 | 0.05 | 0.08 | 0.05 | 0.06 | 0.06 |
| 13-15 years | 0.04 | 0.05 | 0.10 | 0.05 | 0.05 | 0.11 | 0.05 | 0.05 | 0.19 |
| 16 years | 0.04 | 0.04 | 0.39 | 0.04 | 0.04 | 0.38 | 0.06 | 0.06 | 0.73 |
| 17 years or more | 0.07 | 0.07 | 0.39 | 0.07 | 0.07 | 0.96 | 0.10 | 0.10 | 0.58 |
| Unknown | 0.11 | 0.11 | 0.26 | 0.12 | 0.18 | 0.22 | 0.11 | 0.15 | 0.27 |

[1]Includes data for "other races," which are not shown separately.

Table XI. Standard errors of estimates of the average Simplified Oral Hygiene Index for children aged 6-11 years, by sex, race, and geographic region: United States, 1963-65

| Geographic region | Both sexes | | | Boys | | | Girls | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total[1] | White | Negro | Total[1] | White | Negro | Total[1] | White | Negro |
| Northeast | 0.06 | 0.07 | 0.06 | 0.07 | 0.07 | 0.10 | 0.07 | 0.08 | 0.05 |
| Midwest | 0.10 | 0.11 | 0.09 | 0.10 | 0.11 | 0.09 | 0.10 | 0.11 | 0.10 |
| South | 0.09 | 0.06 | 0.17 | 0.10 | 0.07 | 0.20 | 0.07 | 0.06 | 0.14 |
| West | 0.14 | 0.14 | 0.26 | 0.14 | 0.14 | 0.31 | 0.15 | 0.15 | 0.24 |

[1]Includes data for "other races," which are not shown separately.

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